I, the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) of the Deregulation & Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as originally filed in connection with the patent application identified therein.

In accordance with the Patents (Companies Re-registration) Rules 1982, if a company named in this certificate and any accompanying documents has re-registered under the Companies Act 1980 with the same name as that with which it was registered immediately before re-registration save for the substitution as, or inclusion as, the last part of the name of the words "public limited company" or their equivalents in Welsh, references to the name of the company in this certificate and any accompanying documents shall be treated as references to the name with which it is so re-registered.

In accordance with the rules, the words "public limited company" may be replaced by p.l.c., plc, P.L.C. or PLC.

Re-registration under the Companies Act does not constitute a new legal entity but merely subjects the company to certain additional company law rules.

CERTIFIED COPY OF PRIORITY DOCUMENT

Signed

Dated   8 January 2001

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Application Of: Preist et al.

Serial No.: To Be Assigned

Filed: 10/29/01

Group No.: To Be Assigned

Docket No. 30010014-2

For: **Method and Apparatus for Negotiation**

CLAIM OF PRIORITY TO AND
SUBMISSION OF CERTIFIED COPY OF UNITED KINGDOM APPLICATION
PURSUANT TO 35 U.S.C. §119

Honorable Commissioner of
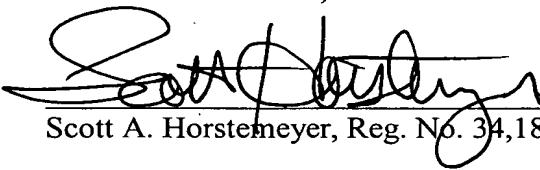Patents and Trademarks
Washington, D.C. 20231

Sir:

In regard to the above-identified pending patent application and in accordance with 35

U.S.C. §119, Applicant hereby claims priority to and the benefit of the filing date of United

Kingdom patent application entitled, "Method and Apparatus for Negotiation", filed

November 3, 2000, and assigned serial number 0027014.0. Further pursuant to 35 U.S.C.

§119, enclosed is a certified copy of the United Kingdom patent application

Respectfully Submitted,

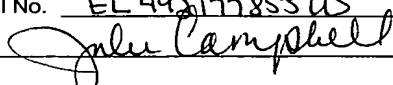**THOMAS, KAYDEN, HORSTEMEYER
& RISLEY, L.L.P.**

By: _____
Scott A. Horstemeyer, Reg. No. 34,183

100 Galleria Parkway, Suite 1750
Atlanta, Georgia 30339
770-933-9500

Patents Form 1/77

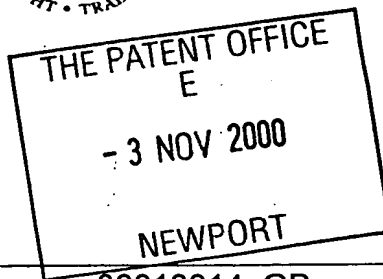**Patents Act 1977**
(Rule 16)

06NOV00 E581536-1 001465
P01/7700 0.00-0027014.0

1/77

Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

THE PATENT OFFICE
E
- 3 NOV 2000
NEWPORT

The Patent Office

Cardiff Road
Newport
South Wales
NP10 8QQ

1.	Your reference	30010014 GB

2.	Patent application number *(The Patent Office will fill in this part)*	**0027014.0**	I-3 NOV 2000

3. Full name, address and postcode of the or of each applicant *(underline all surnames)*

Hewlett-Packard Company
3000 Hanover Street
Palo Alto
CA 94304, USA
496588004
Delaware, USA

Patents ADP number *(if you know it)*

If the applicant is a corporate body, give the country/state of its incorporation

4. Title of the invention   Method and apparatus for negotiation

5. Name of your agent *(if you have one)*

"Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*

Richard A Lawrence
Hewlett-Packard Ltd, IP Section
Filton Road
Stoke Gifford
Bristol BS34 8QZ

Patents ADP number *(if you know it)*   *744803800l*

6.	If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and *(if you know it)* the or each application number	Country	Priority application number *(if you know it)*	Date of filing *(day / month / year)*

7.	If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application	Number of earlier application		Date of filing *(day / month / year)*

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? *(Answer 'Yes' if:*

   a) *any applicant named in part 3 is not an inventor, or*

   b) *there is an inventor who is not named as an applicant, or*

   c) *any named applicant is a corporate body.*

   See note (d))

Yes

Patents Form 1/77

9. Enter the number of sheets for any of the
   following items you are filing with this form.
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Continuation sheets of this form	
Description	55
Claim(s)	5
Abstract	1
Drawing(s)	

10. If you are also filing any of the following,
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Priority documents	
Translations of priority documents	
Statement of inventorship and right to grant of a patent (Patents Form 7/77)	
Request for preliminary examination and search (Patents Form 9/77)	1
Request for substantive examination (Patents Form 10/77)	
Any other documents (please specify)	fee sheet

11.

I/We request the grant of a patent on the basis of this application.

Signature   Date

Richard A Lawrence 3 November 2000

12. Name and daytime telephone number of
    person to contact in the United Kingdom

K Nommeots-Nomm Tel: 0117-312-9947

Warning

After an application for a patent has been filed, the Comptroller of the Patent Office will consider whether publication or communication of the invention should be prohibited or restricted under Section 22 of the Patents Act 1977. You will be informed if it is necessary to prohibit or restrict your invention in this way. Furthermore, if you live in the United Kingdom, Section 23 of the Patents Act 1977 stops you from applying for a patent abroad without first getting written permission from the Patent Office unless an application has been filed at least 6 weeks beforehand in the United Kingdom for a patent for the same invention and either no direction prohibiting publication or communication has been given, or any such direction has been revoked.

Notes

a) *If you need help to fill in this form or you have any questions, please contact the Patent Office on 0645 500505.*

b) *Write your answers in capital letters using black ink or you may type them.*

c) *If there is not enough space for all the relevant details on any part of this form, please continue on a separate sheet of paper and write "see continuation sheet" in the relevant part(s). Any continuation sheet should be attached to this form.*

d) *If you have answered 'Yes' Patents Form 7/77 will need to be filed.*

e) *Once you have filled in the form you must remember to sign and date it.*

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METHOD AND APPARATUS FOR NEGOTIATION

Negotiation Framework: Value Proposition

The negotiation framework aims to provide infrastructure that allows two or more independent entities to interact with each other over time to reach agreement on the parameters of a contract. It is aimed primarily, though not exclusively, as a means to reach trade agreements. It can be used both by automated entities, and by users via appropriate software tools.

Its value to *negotiation participants* is that it is a prerequisite to provide decision support or automation of the negotiation, and hence make the process more efficient. Furthermore, they can be confident that the basic rules of interaction in any negotiation are standardised, hence reducing the effort to automate many different kinds of business interactions. They are able to negotiate simple contracts, where only price is undetermined, and more complex contracts where many complex parameters depend on each other. Furthermore, the protocols provide the participants with trust guarantees, that no party has access to extra information or is able to forge false information.

Its value to *negotiation hosts* such as auction houses and market makers is that it provides a standard framework that all potential customers can use to interact with them. However, it does not require a specific market mechanism, so allows the host to decide on an appropriate one. It provides standard off-the-shelf market mechanisms (eg the English auction), but also allows custom mechanisms to be implemented for particular special needs (eg the FCC auction).

Requirements on the Negotiation Framework

1. The framework should be sufficiently formal that automated entities (e-services) can interact with it.
2. The framework should allow negotiation about simple and complex objects.
3. The framework should be sufficiently general that a variety of different market mechanisms (eg 1-1 negotiation, combinatorial auctions, exchanges) can be expressed as specific instances of it.
4. The framework should be built on appropriate security mechanisms and protocols that participants can do business in a trusted way.
5. The framework should allow, but not require, the existence of a third party to arbitrate a given negotiation (eg an auctioneer in an auction.)
6. The framework should support existing ways people do business, as well as permitting more radical approaches in the future.

Negotiation Framework:

3.4 Service Provisioning: Matchmaking and Negotiation

The interaction between any two enterprises can be broken down into the following phases:

1. Identifying potential business partners. This involves looking for businesses potentially able to meet your needs through one or more matchmakers, and/or using existing business partners.
2. Determining which business partner to reach agreement with, and identifying the terms and conditions of the interaction. This involves introspecting and negotiating with the set of potential partners, to select one.
3. Agree on a contract which formalises the interaction. The contract must not only embody the terms and conditions of the agreement reached through negotiation, but also specify the way in which the business processes of the two organisations will interact.
4. Execute interaction.
5. Monitor interaction: This involves managing and monitoring the interaction.

The provisioning steps (1,2 and 3, above) are described in the following sections. There are two aspects to provisioning – the lookup and advertising of capabilities done through the match-making communication infrastructure, and negotiation between potential partners to decide whether to go ahead, and if so under what terms and conditions. Both stages are necessary, but the negotiation stage is often trivial – many businesses will offer a simple 'take it or leave it' set of terms and conditions, including a fixed price, through the matchmaker, and the party making the lookup simply chooses between the set of 'take it or leave it' offers.

One can think of matchmaking as a specialised infrastructure service that helps in locating potential partners, and negotiation as a set of mechanisms that any service can use to reach agreement with other services.

3.4.1 Matchmaking

Matchmaking is the process of putting service providers and service consumers in contact with each other. The matchmaker is where services that want to be dynamically discovered register themselves, and where services that want to find other services send their request for matches. Some of the services advertising themselves through the matchmaker will be simple end-providers, while others may be brokers, auction houses and marketplaces which offer a locale for negotiating with and selecting among many potential providers. The matchmaker is a very simple, foundational, service on which the rest of the service framework rests, and should be as neutral as possible. It is the web-spider search engine of the e-services world. Other value-added services can take output from matchmakers to assist a service consumer in their selection of a business partner – they could provide recommendations over the set of results based on quality data, past performance metrics and prices, current state of the market etc –however, this is outside the scope of the Service Framework Spec, but is instead a set of value-added trust services which can be built on top of it.

For example, a service consumer wishing to place an order for DRAM may send a message to the matchmaker, and receive pointers to direct suppliers such as INTEL,

an industry exchange such as E-HITEX and excess inventory auction sites such as fastparts.com.
In addition to service provider data, matchmakers may contain registrations from service consumers who wish to be dynamically discovered by providers.

A matchmaker receives a lookup request containing a *service/product description*, and returns a set of *agreement templates*, each with associated *negotiation locales*. The service description specifies the nature of the product/service the initiator wishes to trade.
The matchmaker returns all agreement templates which specify that they are able to reach agreements on the given service/product.
The agreement templates provide details about the kind of agreement that can be reached at the associated negotiation locale. They do this by specifying the fields the agreement has, and potentially associating constraints with each field. If the locale is a catalog for a supplier, the agreement template will specify the values for all fields including price, except customer name, address, etc. Hence they are not open to negotiation. If the locale is an auction site, the price will not be fixed in the template, showing that the price is negotiable. This will be discussed more fully in the section on negotiation.

Optionally, the service provider/consumer initiating the lookup may send an agreement template within the lookup request. In this case, the matchmaker returns all template/locale pairs with templates that are compatible with that of the initiator. Two templates are compatible if they ??? have the same fields, and the constraints on each field are not mutually exclusive.

3.4.1.1 Interactions with Matchmakers
This section outlines the kinds of interactions that a matchmaker has with service provider/consumers. In addition to the matchmaker, the actors are the *advertiser*, a service provider or consumer wishing to advertise its availability to trade, and the *client*, a service provider or consumer wishing to locate potential trading partners.

1. The advertiser gets reference to matchmaker.
2. The advertiser registers an agreement template with the matchmaker.
3. The client gets reference to matchmaker.
4. The client sends lookup request to the matchmaker.
5. Matchmaker responds with a set of (agreement template, negotiation locale) pairs.

In this section, we focus on steps 2, 4 and 5.

Advertising

An advertising conversation consists of a simple exchange of two messages. The advertiser sends an 'advertise' message, and receives an 'advertise-reply' message in response.

Advertise messages have the following format;

```
<ElementType name = "advertise" content="eltOnly" model="open">
```

```
<attribute type ="sender id" >
<attribute type ="pointer to negotiation locale host">
<element type ="agreement template">
</ElementType>
```

Advertise reply messages have the following format;

```
<ElementType name = "advertise-reply" content="eltOnly" model="open">
<element type ="status" >
<element type ="advertiseID">
</ElementType>
```

The status element determines if the advertisement was accepted by the matchmaker. The matchmaker can reject advertisements is they are not well-formed, or do not comply with any advertising restrictions which the particular matchmaker has adopted. (For example a matchmaker may accept only proposed agreements to sell, or agreements associated with particular kinds of service.)

The advertiseID can be used by the advertiser to identify it in future interactions with the matchmaker, if they wish to change or delete it. To do this, they may use the following messages;

Advertise-retract messages are used to delete an existing advertisement. The message is structured as follows;

```
<ElementType name = "advertise-retract" content="eltOnly"
model="open">
<element type ="advertiseID">
</ElementType>
```

In receipt of this, a matchmaker deletes the corresponding advertisement, and responds with an advertise-reply message.

Advertise-modify messages allow the negotiation locale and/or agreement template associated with a given advertiseID to be changed. This is equivalent to an advertiser sending an advertise-retract message followed by an advertise message, and the matchmaker assigning the same advertiseID to the new advertisement. The message is structured as follows;

```
<ElementType name = "advertise-modify" content="eltOnly"
model="open">
<attribute type ="sender id" >
<attribute type ="pointer to negotiation locale host">
<element type ="agreement template">
</ElementType>
```

The matchmaker responds with an advertise-reply message, indicating success or failure of the proposed modification.

Lookup

A lookup conversation consists of a simple exchange of 2 messages. The initiator sends a lookup-request message to the matchmaker, detailing the criteria which they

wish to use to locate potential traders, and the matchmaker replies with a list of agreement templates and associated negotiation locales.

The messages are structured as follows;
```
<ElementType name = "lookup-request" content="eltOnly" model="open">
<element type ="agreement template">
</ElementType>
```

The agreement template specifies the criteria the initiator is interested in. Often, only the service/product description section of the agreement template will be instantiated (together with the buyer or seller, which will be instantiated to the initiator), and all other fields will be left unconstrained. This will allow the initiator to locate all potential trade partners for a given product or service description.

```
<ElementType name = "lookup-reply" content="eltOnly" model="open">
<element type = "lookup result">
LIST OF:
        <attribute type ="pointer to negotiation locale host">
        <element type ="agreement template">
</ElementType>
```

The lookup result can be success or fail. Fail means that the lookup was ill-formed, or could not be processed for some other reason. The list of results give the agreement templates and locations of all potential traders. If no lookups are found, the result will be success but the list of results will be empty.

[Possible extensions;
- Allow initiator to restrict the length of the result.
- Allow the initiator to accept 'near' matches
- Allow subscription services; 'notify me if someone registers interest in this kind of template']

3.4.2 Negotiation

3.4.2.1 What Can One Negotiate?

Negotiation is the process by which two (or more) parties interact to reach an agreement. Usually this will be about some business interaction such as the supply of a service in return for payment. However, the concepts described in this section are sufficiently general that they can be used to negotiate other forms of agreement.

To be able to negotiate with each other, parties must initially share an *agreement template*. This specifies the different parameters of the negotiation (eg product type, price, supply date etc). Some of the parameters will be constrained within the template (eg product type will almost always be constrained in some way) while others may be completely open. The agreement template is decided at the matchmaking stage – matchmaking is exactly the process by which one party locates other parties with agreement templates compatible with their needs.

Depending on what parameters a party is willing to negotiate on, it will adopt more or less constrained agreement templates. For example, a party that is willing to negotiate

nothing (such as a catalog) will only advertise a fully instantiated agreement template, with a fixed price. A party willing to negotiate features of a product, such as colour, as well as price and delivery date, will leave these parameters unconstrained.

The process of negotiation is the move from an *agreement template* to an *agreement* which the agreeing parties find acceptable. A single negotiation may involve many parties, resulting in several agreements between different parties and some parties who do not reach agreement. For example, a stock exchange can be viewed as a negotiation where many buyers and many sellers meet to negotiate the price of a given stock. Many agreements are formed between buyers and sellers, and some buyers and sellers fail to trade.

After an agreement is reached, it is necessary to formalise this and to determine how the business processes will interact with each other. This is the process of moving from agreement to *contract*, and will be dealt with in section ???.

In this document, we assume that all agreements are between two parties. However, the majority of the protocol described generalises in a straightforward way to handle agreements between more than two parties.

3.4.2.2 The General Negotiation Protocol

When discussing negotiation, it is important to distinguish between the *negotiation protocol* and the *negotiation strategy*. The protocol determines the flow of messages between the negotiating parties – who can say what, when – and acts as the rules by which the negotiating parties must abide by if they are to interact. The protocol is necessarily public and open. The *strategy*, on the other hand, is the way in which a given party acts within those rules in an effort to get the 'best' outcome of the negotiation – for example, when and what to concede, and when to hold firm. The strategy of each participant is necessarily private, and hence an exploration of appropriate strategies falls outside the Service Framework Specification.

The Service Framework Specification offers a general negotiation protocol, by which service buyers and service sellers can interact. This general protocol can be specialised to give specific kinds of negotiation – such as catalog purchase sites, auctions, exchanges and multi-attribute one-to-one negotiation. Any trader able to participate in the general protocol will be able to participate in a specialised form of it, though its strategy may need to be altered.

There are 2 main roles in negotiation – *participant*, and *negotiation host*. The participants are those who wish to reach agreement, and usually they are subdivided into *service buyers* and *service sellers*. The negotiation host is the role responsible for enforcing the protocol and rules of negotiation. The host is often a third party outside the negotiation - In the case of an auction, the host is the auctioneer. In the case of an exchange, the host is the market provider. However, the host may also be a participant - In 1-1 negotiation or catalog provision, this is usually the case.

The general negotiation protocol consists of 5 main stages;

1. Potential participants request the negotiation host for admission to the negotiation. If they are accepted, they receive the agreement template and rules specifying how the negotiation takes place (eg is it an auction, an exchange, a catalog purchase site, etc.)
2. Negotiation takes place by participants making proposals. These proposals consist of constrained or instantiated versions of the agreement template. Participants may make proposals only according to the rules of the negotiation received at admission.
3. During negotiation, the host informs participants of the current status of the negotiation, either by sending them current proposals, or by sending some form of 'digest' (for example, the current 'best' proposal.) The content of these messages is determined by the rules.
4. In circumstances determined by the rules, the negotiation host identifies compatible proposals, and converts them into agreements.
5. In circumstances determined by the rules, the negotiation host closes the negotiation locale, and determines any final agreements.

3.4.2.3 Protocol Messages

In this section, we specify the XML messages and conversations associated with the general protocol.

Admission
The authentication, authorisation and admission procedure is identical to the general procedure for admission to services ??described elsewhere in the SFS.

When admission is successful, the negotiation host sends a message specifying the session handle, the agreement template, and a document containing the rules of negotiation;

```
<ElementType name = "negotiation-rules" content="eltOnly"
model="open">
<element type = "negotiation session handle">
<element type ="agreement template" >
<element type ="negotiation rules">
</ElementType>
```

Negotiation
Negotiation consists of the sending of a series of proposals to the negotiation host. Proposals may be sent at any time. If a proposal does not conflict with the negotiation rules, the host will accept and process the proposal appropriately. If the proposal does conflict with the rules, the host will simply ignore the proposal. NB This means it is the responsibility of the proposer to watch the information returned during the information display phase to determine if the proposal was successfully submitted.

```
<ElementType name = "propose" content="eltOnly" model="open">
<element type = "negotiation session handle">
<element type ="proposal" >
</ElementType>
```

The proposal consists of a constrained form of the agreement template, specifying attribute values or value ranges which are acceptable to the proposer. For example, a buyer may constrain the price attribute to be less than $100.

If the negotiation rules allow, a participant may withdraw a previously submitted proposal by sending the following message;

```
<ElementType name = "proposal-withdraw" content="eltOnly"
model="open">
<element type = "negotiation session handle">
<element type ="proposal" >
</ElementType>
```

Information Display

The negotiation host sends information about the current status of negotiations to all participants, as defined by the information display rules. By default, this consists of a set of current proposals. However, in certain circumstances, other information could be sent as well or instead. Also, some participants may receive different information from others

```
<ElementType name = "negotiation-status" content="eltOnly"
model="open">
LIST OF:
<element type = "negotiation session handle">
<element type ="proposal" >
</ElementType>
```

The host expects no reply to these messages.

Participants may also withdraw from negotiations by sending a negotiation-withdraw message. Often it is possible to withdraw at any time, though in some negotiations, the negotiation rules will only allow withdrawing in certain circumstances. (For example, in an auction, it is not possible to withdraw if you have the best current bid.)

```
<ElementType name = "negotiation-withdraw" content="eltOnly"
model="open">
<element type = "negotiation session handle">
</ElementType>
```

The host responds to a withdraw message by removing all proposals from that participant.

Agreement Formation

In circumstances determined by the agreement formation rules, the negotiation host checks existing proposals for compatibility. If all required attributes of a proposal are specified and agreed between at least 2 parties, the host determines which parties actually will form an agreement, and notifies successful parties of the outcome by sending them agreements with all attributes specified. In cases where more than one agreement is possible, the negotiation host uses the agreement rules to determine which participants have priority.

```
<ElementType name = "negotiation-agreement" content="eltOnly"
model="open">
<element type = "negotiation session handle">
<element type ="agreement">
</ElementType>
```

The agreeing parties use the agreement in the contract formation phase. (See section ??)

Locale Closing

The negotiation locale closes in circumstances determined by the negotiation rules. (eg when all participants have agreed or withdrawn, at a given time, after a period of quiescence, etc.) At this point, the host notifies all participants with a negotiation-close message, and any further proposals sent are ignored ;

```
<ElementType name = "negotiation-close" content="eltOnly"
model="open">
<element type = "negotiation session handle">
</ElementType>
```

3.4.2.4 Protocol Conversation - Participant

In this section, we specify the different states a participant can be in, and what messages they can send in each state.

STATE: Enter Negotiation
ACTIONS: Sub-conversation associated with authorisation and admission.
TRANSITIONS:
Receive 'negotiation-rules' -> Negotiating

STATE: Negotiating
ACTIONS:

Send 'propose' (if negotiation rules currently allow)
Send 'withdraw proposal' (if negotiation rules allow)
Send 'negotiation-withdraw' (if negotiation rules currently allow)
Receive 'negotiation status'.
TRANSITIONS:
IF receive 'negotiation-agreement' -> Negotiation-Success
IF send 'negotiation-withdraw' -> Negotiation-NoDeal
IF receive 'negotiation-close' and no 'negotiation-agreement'
-> Negotiation-NoDeal

STATE: Negotiation-Success
ACTIONS:

End of negotiation. Move into contract formation conversations.

STATE: Negotiation-NoDeal
ACTIONS:

End of negotiation. Return to negotiation admission or matchmaking conversations.

3.4.2.5 Protocol Conversations – Negotiation Host

The negotiation host can carry out multiple conversations with the different negotiation participants. These conversations have the following states;

STATE: Admit Participant
ACTIONS: Sub-conversation associated with authorisation and admission.
     Send 'negotiation-rules'
TRANSITIONS:
     Send 'negotiation-rules' -> Host Participant

STATE: Host Participant
ACTIONS: Send 'negotiation-status' according to the negotiation rules.
     Send 'negotiation-agreement' according to the negotiation rules.
     Send 'negotiation-close' according to the negotiation rules.
TRANSITIONS:
     Send 'negotiation-agreement' -> Participant-Success
     Send 'negotiation-close'
         -> End Negotiation
     Receive 'negotiation-withdraw' -> Participant -NoDeal

STATE: Participant-Success
ACTIONS: End of this participant's involvement in negotiation.
     Transfer to contract formation/fulfilment entities.

STATE: Participant-NoDeal
ACTIONS: End of this participants involvement in this negotiation.
     Participant must reapply to enter if they wish to in the future.

STATE: End Negotiation
ACTIONS: Determine final agreements according to negotiation rules.
     Send final 'negotiation-agreement' messages.
     Send final 'negotiation-status' messages.
     End of all participants' involvement in negotiation.

Negotiation Framework: Use cases

Use cases

Define admission policy

Define agreement template

aParticipant :
Participant

theHost:
NegotiationHost

Define negotiation rules

Define agreement formation

...cipant
...nt

nfrastructure

theP...
Infrastr... ...vider

anotherParticipant
: Participant

Negotiate

theHost:
NegotiationHost

<<communicate>>

Submit proposal

aParticipant :
Participant

<<communicate>>

Agreement formation

Withdraw proposal

Finalize negotiation infrastructure

aParticipant :
Participant

Withdraw from negotiation

theHost:
NegotiationHost

1. Define Admission Policy

Use Case	Define Admission Policy
Description	The Negotiation Host defines the policies that will be used to admit Participants to negotiation. Participants could be involved in the definition for negotiations such as auctions or RFQs when a participant plays a dominant role.
Assumptions	
Actors	Negotiation Host (primary) Participant
Steps	1. IF participants are involved in the process, Negotiation Host gathers participants input 2. The Negotiation Host defines the admission policy
Variations	
Non-Functional	
Issues	1. Definition of admission policy. 1.1 Language for admission policy

2. Define Agreement Template

Use Case	Define Agreement Template
Description	The Negotiation Host defines the agreement template that will be used as a reference during the negotiation. Participants could be involved in the definition.
Assumptions	
Actors	Negotiation Host (primary) Participant
Steps	1. IF participants are involved in the process, Negotiation Host gathers participants input 2. The Negotiation Host defines the agreement template
Variations	
Non-Functional	
Issues	1. Definition of agreement template and relative operations. See document on agreement template

3. Define Negotiation Rules

Use Case	Define Negotiation Rules
Description	The Negotiation Host defines the rules that Participants will have to comply with during negotiation. Participants could be involved in the definition for negotiations such as auctions or RFQs when a participant plays a dominant role.
Assumptions	
Actors	Negotiation Host (primary) Participant
Steps	1. IF participants are involved in the process, Negotiation Host gathers participants input 2. The Negotiation Host defines the negotiation rules
Variations	
Non-Functional	
Issues	1. Definition of negotiation rules. 1.1 Language for negotiation rules

4. Define Agreement Formation Rules

Use Case	Define Agreement Formation Rules
Description	The Negotiation Host defines the agreement formation rules that will be used during the negotiation. Participants could be involved in the definition.
Assumptions	
Actors	Negotiation Host (primary) Participant
Steps	1. IF participants are involved in the process, Negotiation Host gathers participants input 2. The Negotiation Host defines the agreement formation rules
Variations	
Non-Functional	
Issues	1. Definition of agreement formation rules 1.1 Language for agreement formation rules

5. Admission to Negotiation

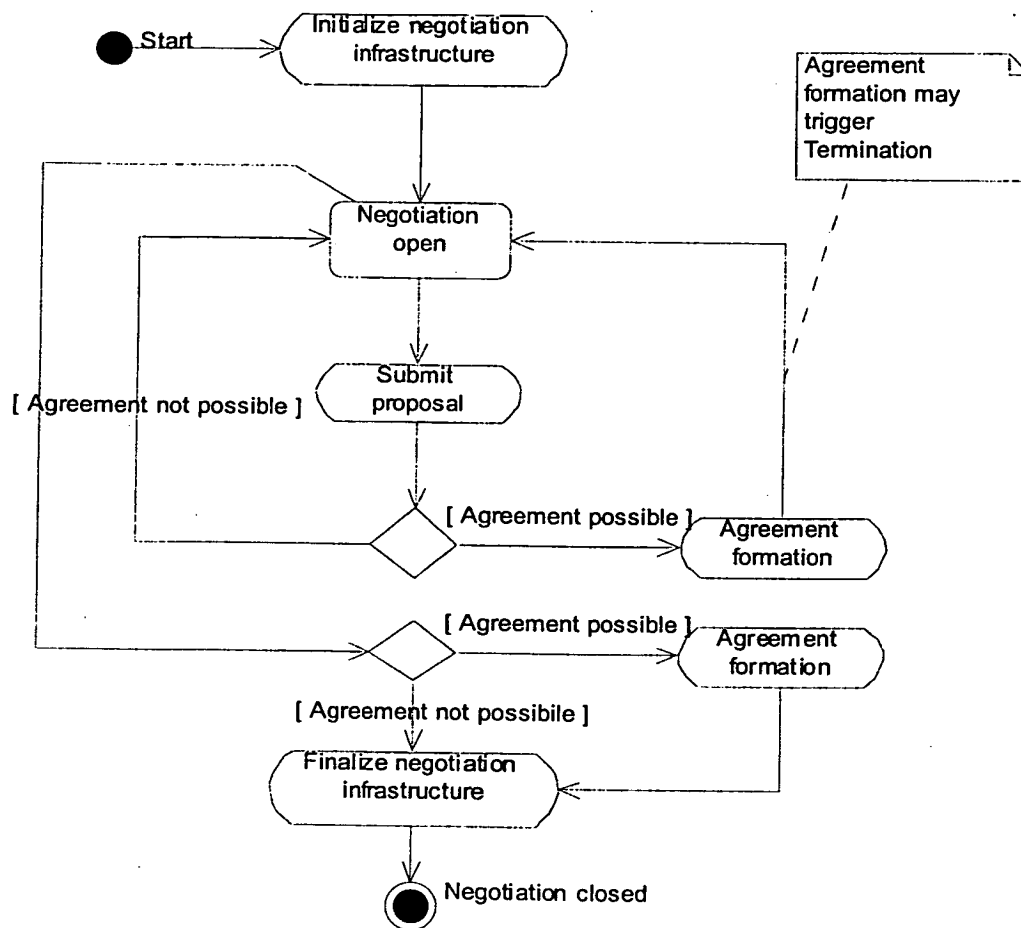| Use Case	Admission to Negotiation
Description	The Gatekeeper admits Participants to the negotiation on verification of their credentials
Assumptions	

Actors	Gatekeeper (primary)
	Participant
Steps	
Variations	
Non-Functional	
Issues	1. Credentials
	2. Admission when negotiation has already started

6. Negotiate

Use Case	Negotiate
Description	Participants negotiate to get to the formation of agreements
Assumptions	A negotiation locale exists and is functional
	A negotiation template exists
Actors	Participant (primary)
	Negotiation Host
Steps	1. PERFORM *Initiate negotiation infrastructure*
	2. REPEAT
	2.1 PERFORM *Submit proposal*
	2.2 IF Agreement possible
	2.2.1 PERFORM *Agreement formation*
	ENDIF
	UNTIL Termination
	3. PERFORM *Finalize negotiation infrastructure*
Variations	
Non-Functional	
Issues	1. Is it general enough to cater for any kind of negotiation?
	2. Might be interleaved with the *Admission to negotiation* use case, if that is allowed by the particular negotiation rules

Activity diagram: Negotiate
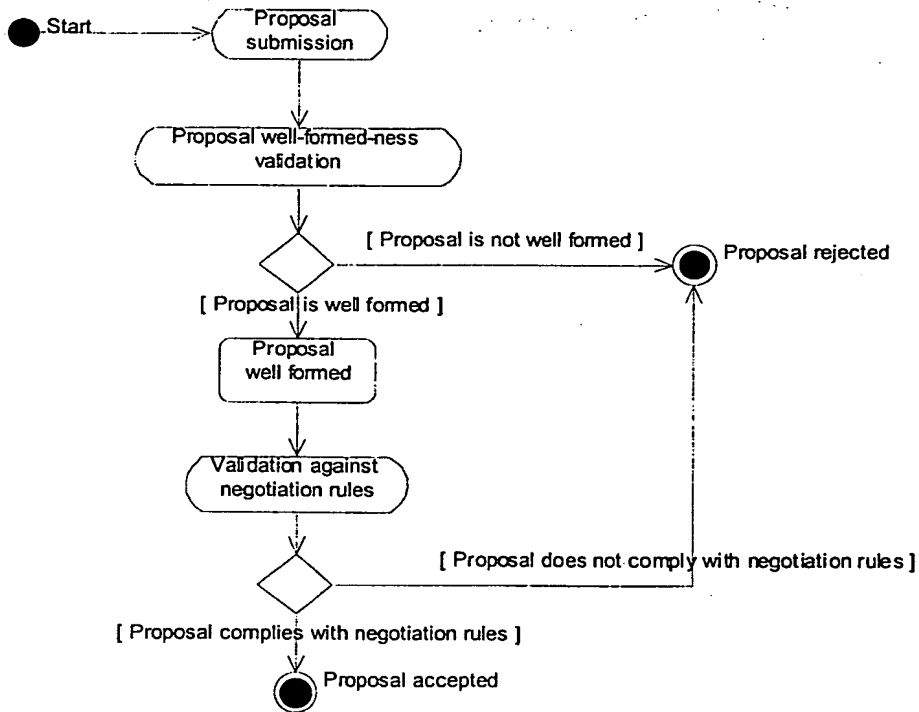
Start →

Initialize negotiation infrastructure

Agreement formation may trigger Termination

Negotiation open

Submit proposal

[Agreement not possible]

[Agreement possible]

Agreement formation

[Agreement possible]

Agreement formation

[Agreement not possibile]

Finalize negotiation infrastructure

Negotiation closed

6.1 Initialize negotiation infrastructure

Use Case	Initialize negotiation infrastructure
Description	Operations and communications preliminary to the negotiation process
Assumptions	
Actors	Negotiation Host (primary) Infrastructure Provider Participant
Steps	
Variations	
Non-Functional	
Issues	

6.2 Submit proposal

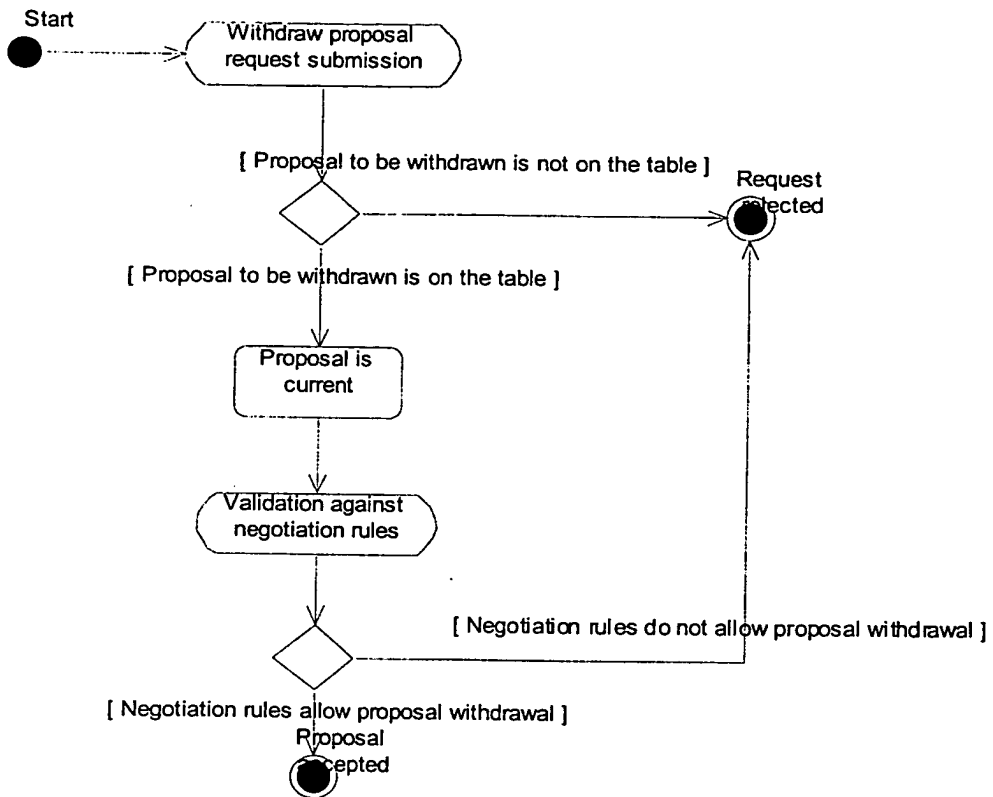| Use Case	Submit proposal
Description	Participant submits a proposal that is validated against the agreement template and the negotiation rules
Assumptions	A negotiation locale exists and is functional An agreement template exists
Actors	Participant (primary) Negotiation Host
Steps	1. Participant send a proposal to the negotiation table 2. Negotiation Host (in the role of proposal validator), validates the proposal against the negotiation template (is the proposal relative to the object we are negotiating over? Is it well formed? Is it conforming to allowed expiration time? ...) 3. If the proposal is not valid, use case ends 4. Negotiation Host (in the role of protocol enforcer) validates the proposal against negotiation rules (is the submitter's turn? Does the proposal comply with the improvement rules? Is negotiation not terminated already?) 5. If the proposal is valid, the current set of proposals and depending data structures are updated accordingly and participants are notified, as defined by visibility rules and information filtering rules.
Variations	
Non-Functional	
Issues	1. Are proposal validator and protocol enforcer fully fledged roles or just responsibilities of the Negotiation Host? 2. Operations such as proposal validation against negotiation template and agreement rules might be difficult to implement. The big advantage though is that this makes it very easy to explain the general protocol.

	3. Definition of negotiation template and relative operations. <Pointer here to document on negotiation template>
	4. Definition of negotiation rules.
	4.1 Language for negotiation rules

## Activity diagram: Submit proposal

6.3 Withdraw proposal

Use Case	Withdraw proposal
Description	Participant requests to withdraw a proposal
Assumptions	A negotiation locale exists and is functional An agreement template exists
Actors	Participant (primary) Negotiation Host
Steps	1. Participant send a request to withdraw a proposal to the negotiation locale 2. Negotiation host (playing the Proposal validator role) checks that the withdraw request refers to a proposal that is currently on the table 3. If this is not the case, use case ends 4. Negotiation host (playing the Protocol enforcer role) validates the withdraw proposal request against negotiation rules (is proposal withdrawal allowed in general? is it allowed to withdraw this particular proposal? Is negotiation not already terminated?) 5. If the withdraw proposal request is accepted, the current set of proposals and depending data structures is updated accordingly and participants are notified. Also, depending on the negotiation rules, agreement formation can be triggered.
Variations	
Non-Functional	
Issues	1. Same issues as in submit proposal

Start

Withdraw proposal
request submission

[Proposal to be withdrawn is not on the table]

Request
rejected

[Proposal to be withdrawn is on the table]

Proposal is
current

Validation against
negotiation rules

[Negotiation rules do not allow proposal withdrawal]

[Negotiation rules allow proposal withdrawal]

Proposal
accepted

6.4 Agreement formation

Use Case	Agreement formation
Description	The Negotiation Host (in the agreement maker role) converts of a set of proposals, into a set of agreements.
Assumptions	A negotiation locale exists and is functional A negotiation template exists
Actors	Negotiation Host (primary)
Steps	1. Negotiation Host (in the agreement maker role) looks at the current set of proposals to determine whether agreements can be made 2. Negotiation Host (in the agreement maker role) applies tie-breaking rules if that is the case 3. Negotiation Host (in the agreement maker role) creates the possible agreements given the proposals on the table and the resolution rules 4. Negotiation Host notifies the participants of agreements that have been made
Variations	
Non-Functional	
Issues	1. Is agreement maker a fully-fledged role or just a responsibility of the Negotiation Host? 2. Definition of agreement formation rules 2.1 Language for agreement formation rules

Activity diagram: Agreement formation
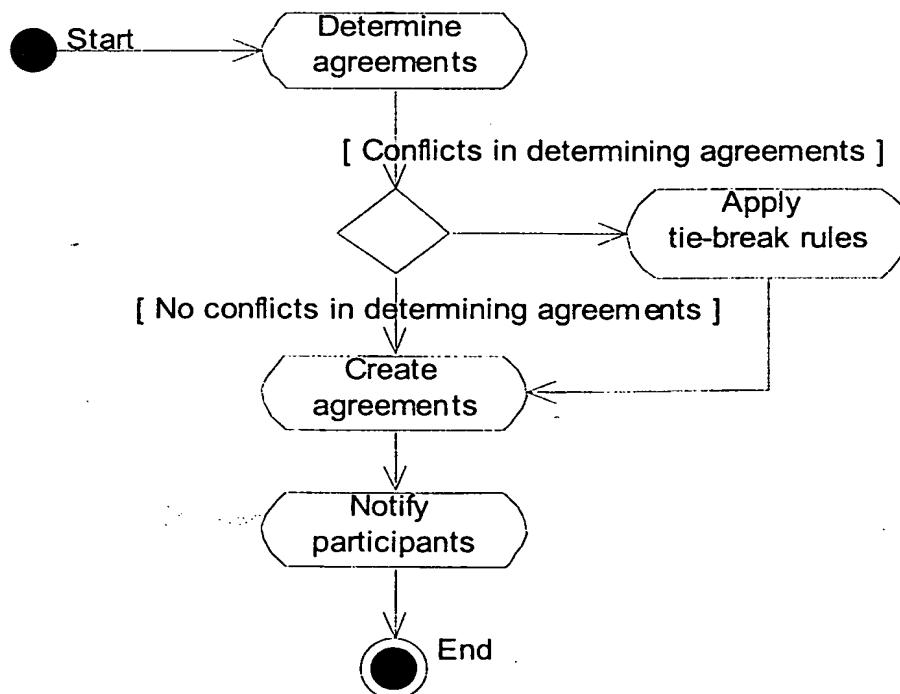
6.5 Finalize negotiation locale

Use Case	Finalize negotiation infrastructure
Description	Operations and communications posterior to the negotiation process
Assumptions	
Actors	Negotiation Host (primary) Infrastructure Provider Participant
Steps	
Variations	
Non-Functional	
Issues	

7. Withdraw from negotiation

Use Case	Withdraw from negotiation
Description	Participant requests to withdraw from negotiation, and negotiation rules permitting, Negotiation Host acts accordingly
Assumptions	The participant is taking part in the negotiation
Actors	Participant (primary) Negotiation Host
Steps	1. Participant requests to withdraw from negotiation 2. If the participant has pending proposals, the negotiation host attempts to withdraw them 3. If the proposals could be withdrawn, the participant is withdrawn from negotiation, otherwise the request is rejected
Variations	
Non-Functional	
Issues	

Negotiation Framework: Security and Trust

Underlying Messaging Infrastructure

Depending on the security of the underlying message infrastructure, the negotiation framework will be able to provide different levels of trust. Here we outline the requirements to provide the maximum level of trust, but fallback positions should be considered in different circumstances.

Privacy –
Negotiation participants should be confident that any message sent to the negotiation locale will only be revealed to other participants.

Non – disruptability –
The locale should not be able to have proposals (or other messages) posted to it or deleted from it without the referee's acceptance.

Uniform view –
Participants should be able to guarantee that the view they have of the locale is accurate, and identical to the view other (similar) participants have.

Fairness of proposal arrival –
Participants should not be disadvantaged in tie-break procedures if their connection to the locale is slow. (In other words, if they send a bid, and another participant sends an identical bid later but over a faster connection, the other participant shouldn't win.)

Which of these requirements can be achieved without assuming that the negotiation host is a trusted third party?

Negotiation Host	Entity responsible for creation and enforcement of rules governing participation, execution, resolution and termination of a negotiation.
Participant	Entity participating in a negotiation by posting proposals according to the rules provided by the negotiation host.
Negotiation locale	Location where negotiation proposals are posted according to the rules enforced by the negotiation host.
Infrastructure provider	Provider of the underlying communications infrastructure of the negotiation locale.
Gatekeeper	Sub-role of negotiation host. Responsible for enforcement of policy governing admission to a negotiation.
Participant credentials	Information, with appropriate trust guarantees, about a participant's attributes, capabilities, etc.
Admission policy	Policy used for determining who is allowed to participate in a given negotiation.
Proposal	Specification of potential value ranges in the agreement template a participant is willing to accept.
Negotiation table	A negotiation locale with 1 buyer and 1 seller.
Auction room	A negotiation locale with 1 seller and many buyers.
Exchange floor	A negotiation locale with many buyers and many sellers.
Proposal validator	Sub role of negotiation host: responsible for ensuring that a proposal is well-formed.
Agreement template	A prototype specifying what is to be negotiated, and the possible values different parts of the prototype can range over.
Proposal well-formed-ness	A proposal is well formed within a given negotiation if all prototypes within it are subsumed by the agreement template.
Proposal expiration time	A parameter in a proposal defining when it no longer can be considered valid.
Negotiation rules	Rules determining the mechanism by which negotiation proceeds – who may make a proposal when, how existing proposals affect what proposals may be made.
Posting rule	Negotiation rule determining in what circumstances a participant may post a proposal.
Visibility rule	Negotiation rule specifying whom, among the participants, has visibility over a submitted proposal.
Display rule	Negotiation rule specifying if and how the referee notifies the participants that a proposal has been submitted – could either be by

	transmitting the proposal unchanged or by transmitting a summary of the situation.
Improvement rule	Negotiation rule specifying, given a set of existing proposals, what new proposals may be posted.
Withdrawal rule	Negotiation rule specifying if and when proposals can be withdrawn from negotiation, and policies over the time expiration of proposals.
Termination rule	Negotiation rule specifying when no more proposals may be posted (e.g. a given time, period of quiescence, etc.).
Protocol enforcer	Sub-role of negotiation host. Responsible for ensuring that participant's proposals are posted according to the negotiation rules.
Agreement	A configuration of the attributes associated agreement template that is understood by the participants as being fully defined, together with the identification of two (or more?) participants.
Agreement formation	The conversion of a set of proposals, at least one pair of which intersect, into a set of agreements.
Agreement maker	The entity responsible for agreement formation.
Agreement formation rules	Rules responsible for determining, given a set of proposals at least one pair of which intersect, which agreements should be formed.
Tie-breaking rule	A specific agreement formation rule applied after all others.

Negotiation Framework: Roles and Responsibilities

Business level view

Role
>Negotiation host

Responsibilities
>Admission policy creation
>Admission policy enforcement
>Negotiation template selection
>Proposal validation (against the agreement template)
>Negotiation rules creation
>Negotiation rules enforcement
>Agreement formation rules creation
>Agreement formation rules enforcement
>Communication infrastructure provision
>Protocol-level security enforcement

Collaborations
>Participant

Role
>Participant

Responsibilities
>Negotiation

Collaborations
>Negotiation host

Next level of refinement: breakdown of the Referee responsibilities

Role
>Infrastructure provider

Responsibilities
>Communication infrastructure provision
>Reliable messaging
>Auditable logging
>Transport security enforcement

Collaborations
>Negotiation host

Role
>Proposal validator

Responsibilities
>Proposal validation (against the negotiation template)

Collaborations

    Negotiation host

Role

    Gatekeeper

Responsibilities

    Admission policy enforcement

Collaborations

    Negotiation host

Role

    Protocol enforcer

Responsibilities

    Negotiation rules enforcement
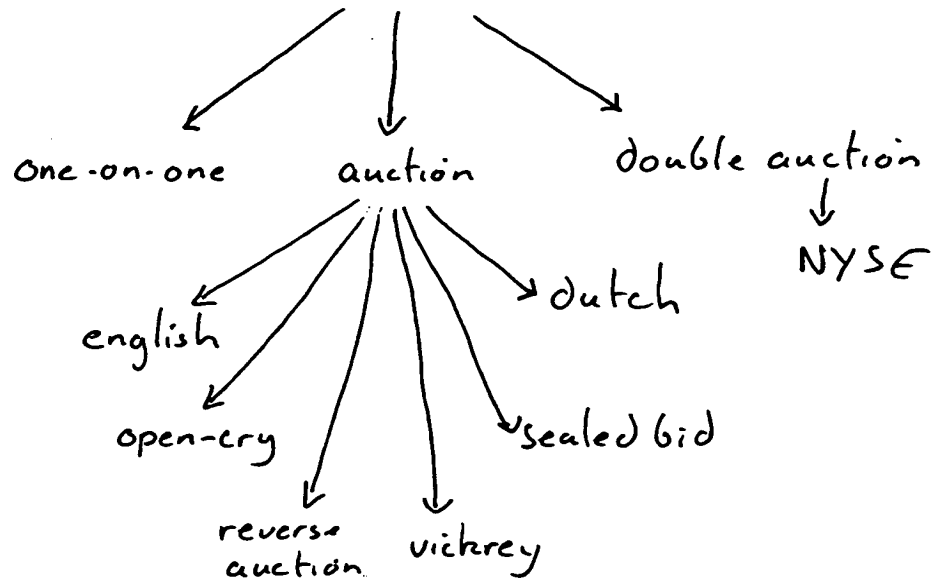
Collaborations

    Negotiation host

Role

    Agreement maker

Responsibilities

    Agreement formation rules enforcement

Collaborations

    Negotiation host

Examples of negotiation types

One-on-one   auction   double auction

double auction → NYSE

auction → english, open-cry, reverse auction, vickrey, sealed bid, dutch

Proposal Validator:
A module that validates proposals against an agreement template.
An agreement template is a sort of a standard form that proposals must comply with.
Negotiation Locale:
A module where validated proposals are posted and forwarded to the relevant parties in the negotiation process. (Relevant information other than validated proposals about the negotiation process may be transported using the negotiation locale)
Proposal Compatibility Checker:
A module that compares pairs of proposals that have being posted on the negotiation locale. It returns information on whether the two proposals are compatible with each other.

Protocol Enforcer:
A module for rejecting invalid proposals

Information Editor:
A module for summarizing information related to the negotiation process and for feeding it back to the negotiation locale
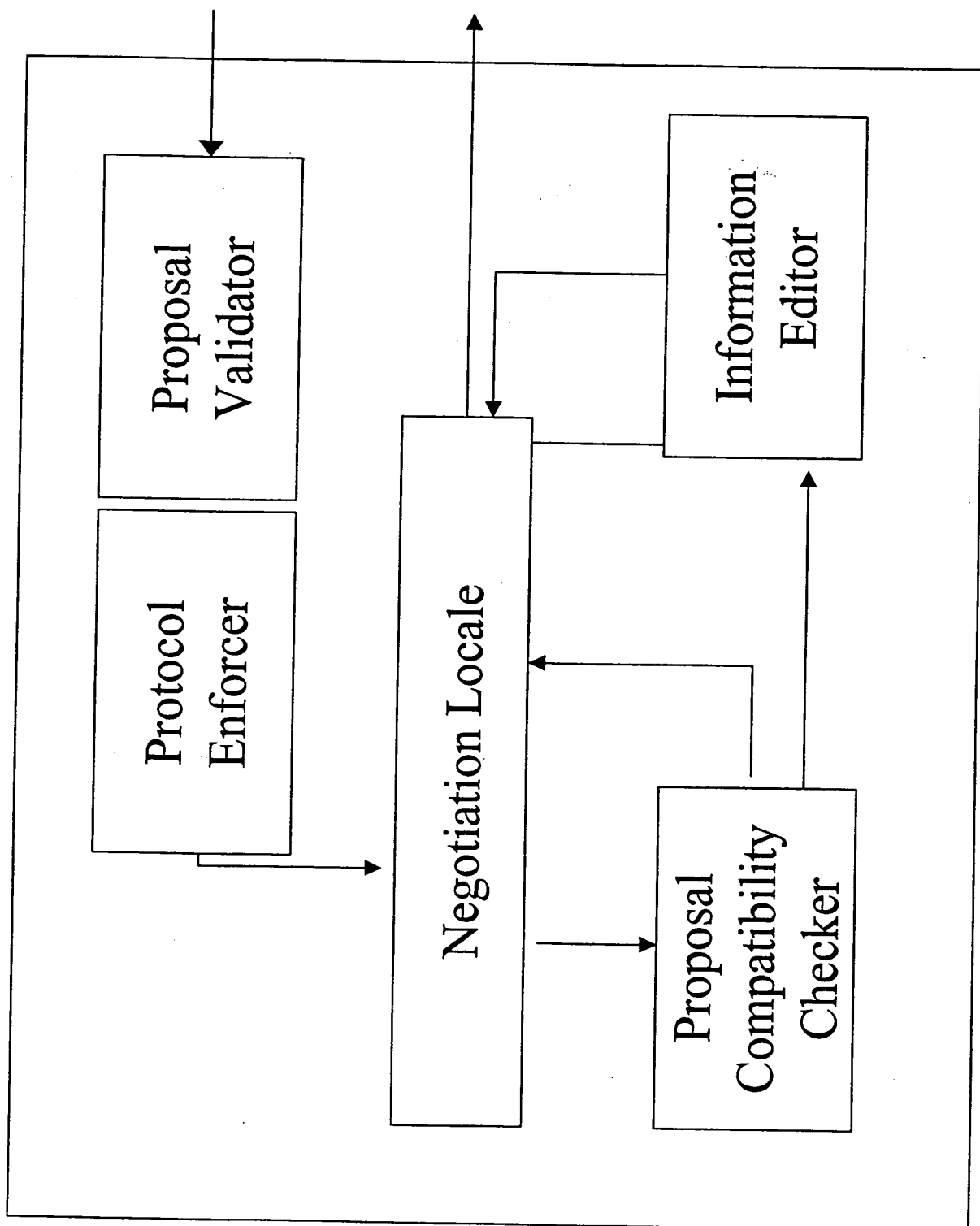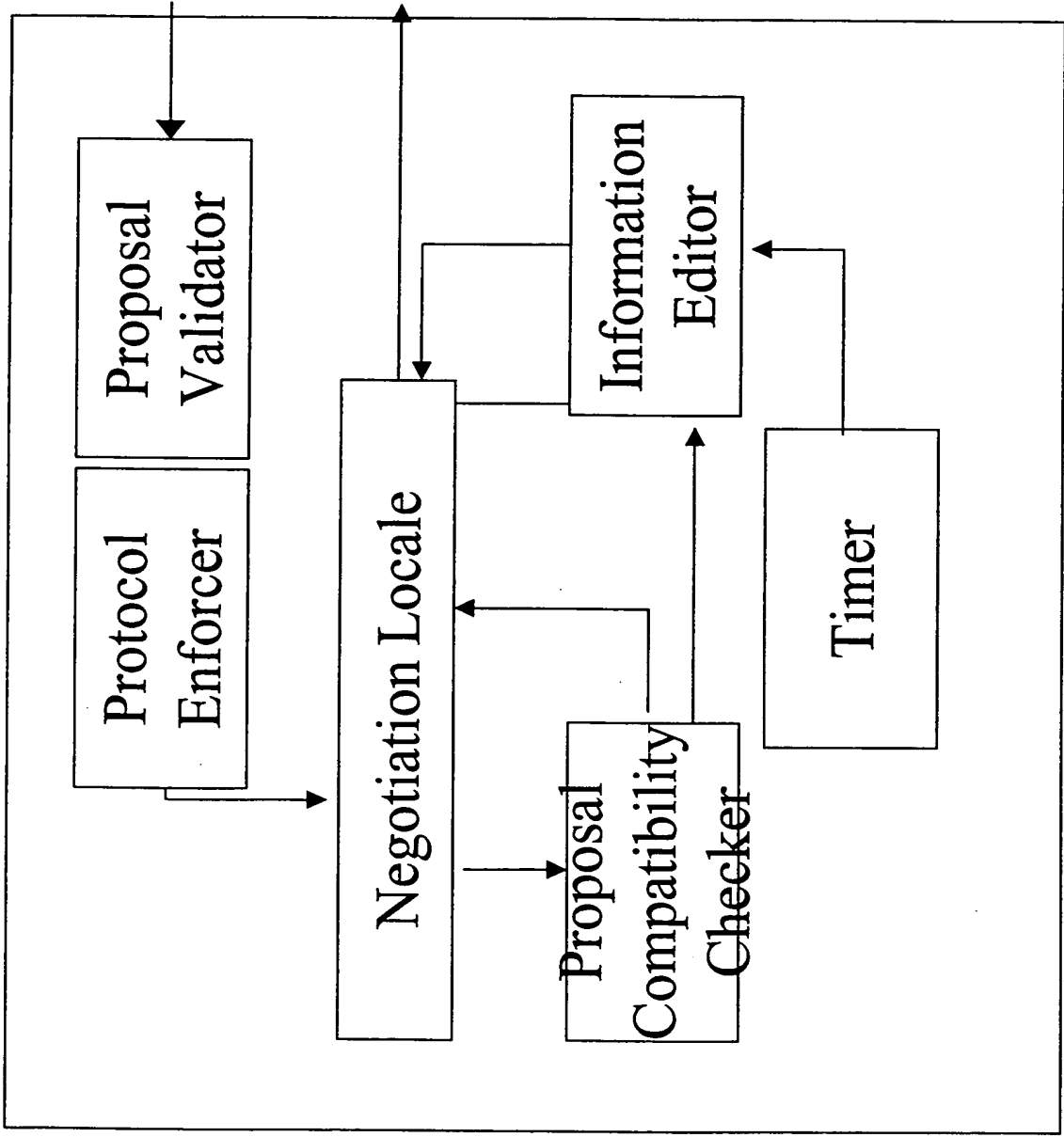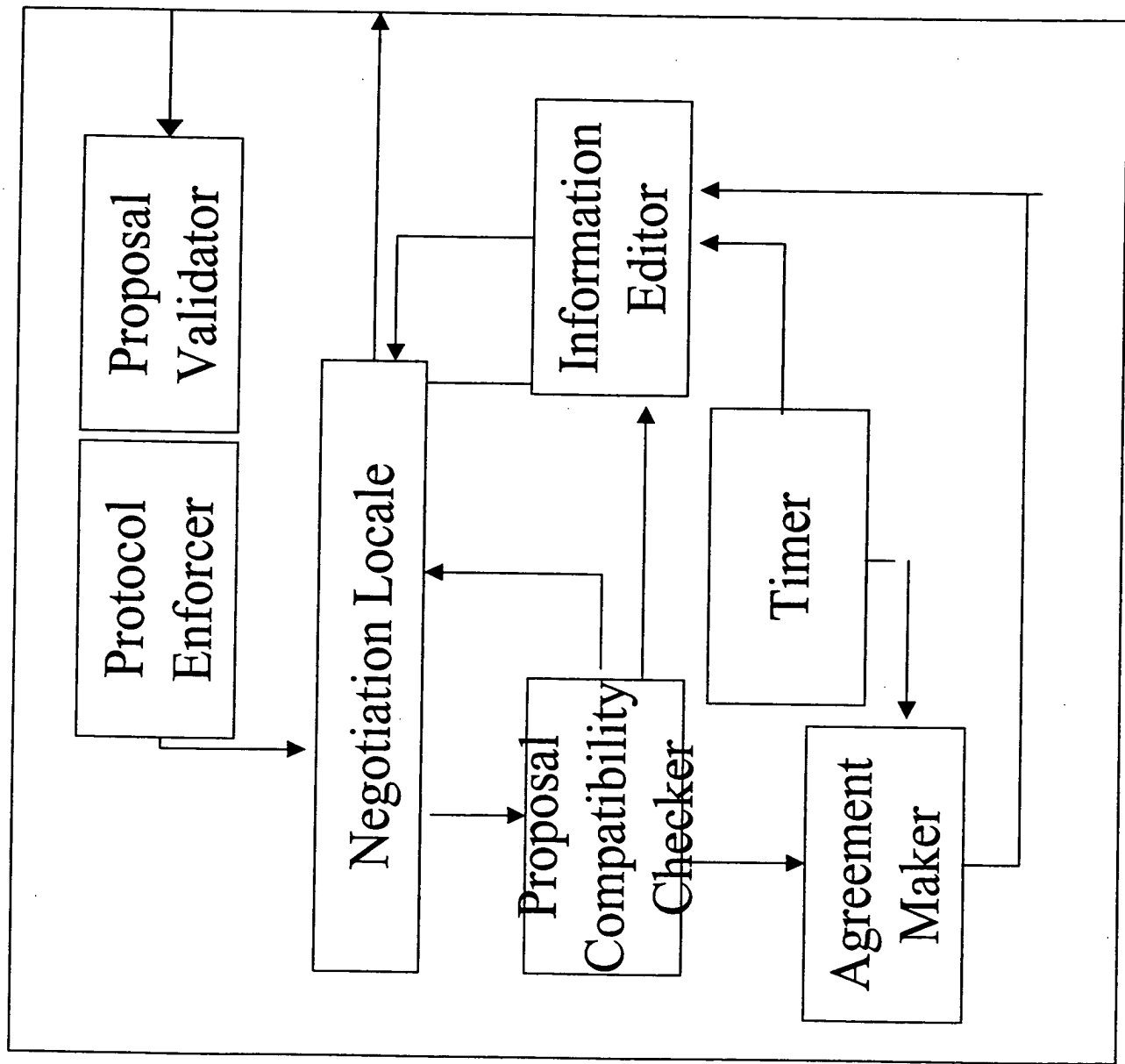
Timer: A timer module

Agreement Maker:
A module responsible for refining an agreement that is possible given two or more compatible proposals

Proposal Validator

Negotiation Locale

Proposal Compatibility Checker
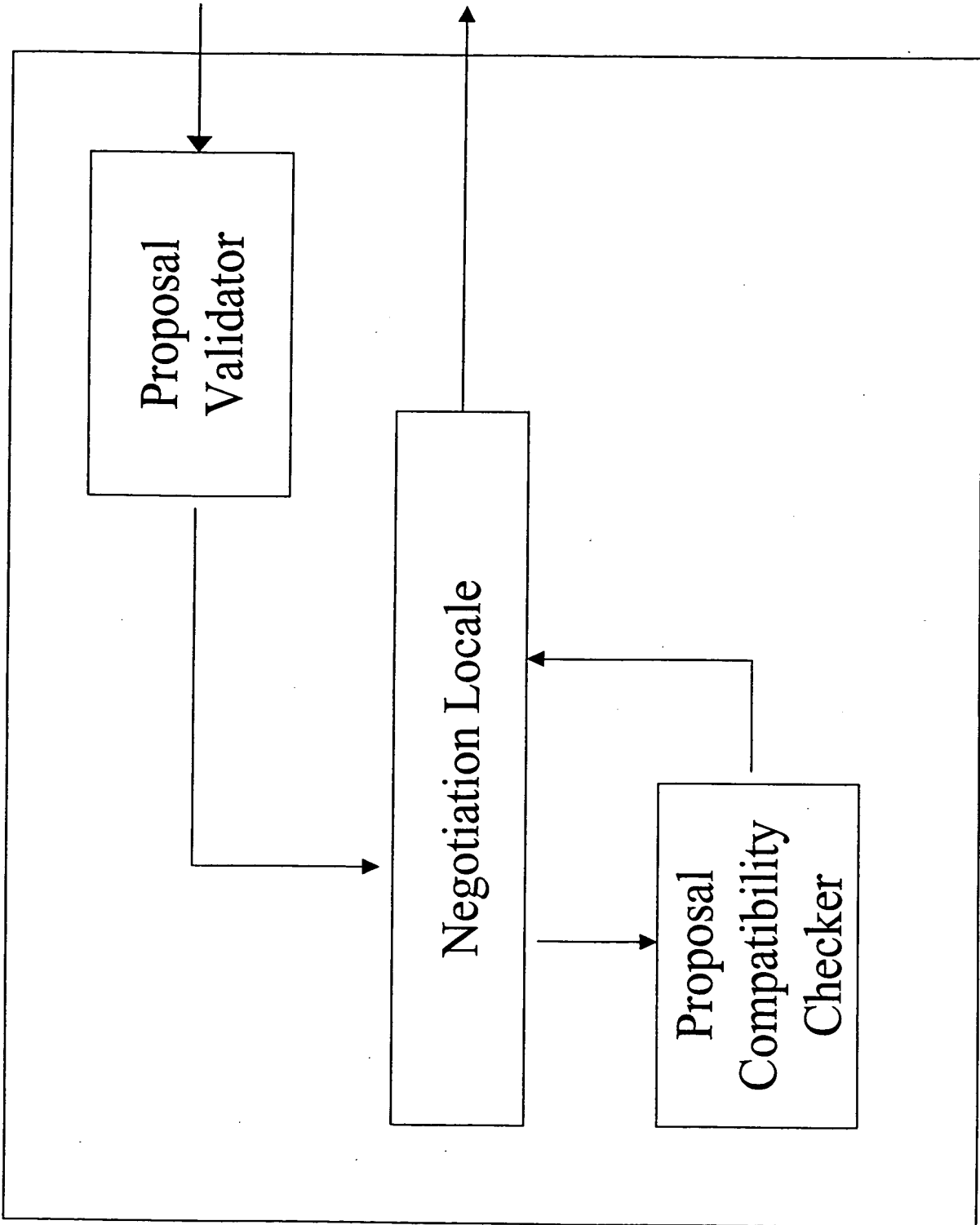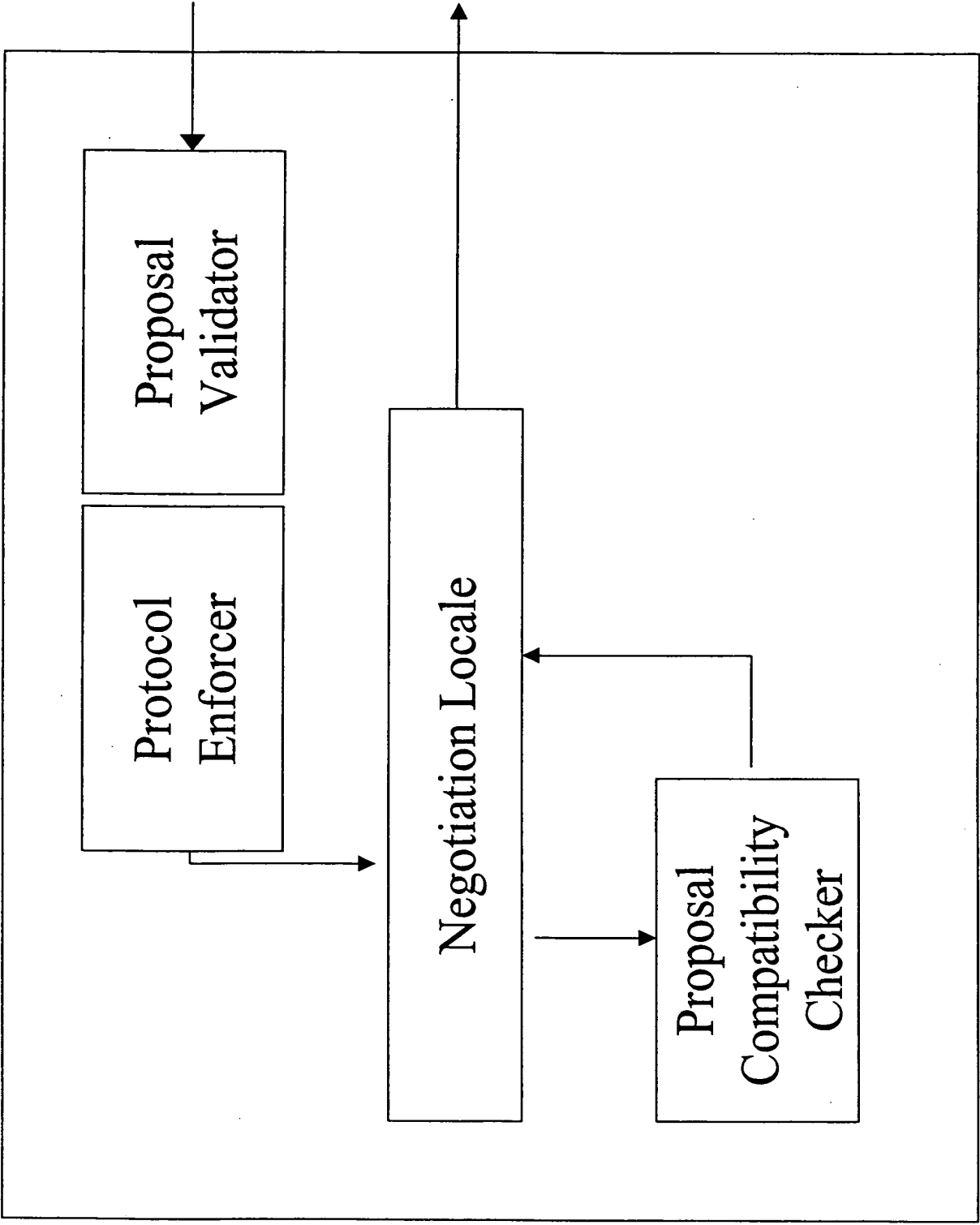
A Framework for Negotiation

Outline

- Value Proposition
- Requirements
- Actors in Negotiation
- Use Cases for Negotiation
- Phases of Negotiation
- Rules for Negotiation
- Example
- Conclusion

Value Proposition

- To provide infrastructure that allows two or more independent entities to reach agreement on the parameters of a contract

- To provide the negotiating entities with support for automation by standardizing the rules of negotiation

- To provide negotiation hosts with a standard framework that customers will use when interacting with them

Requirements

- Be sufficiently formal

- Allow negotiation about simple and complex objects.

- Be sufficiently general

- Built on appropriate security mechanisms and protocols

- Allow, but not require, the existence of a third party to arbitrate a given negotiation

- Support existing ways people do business, as well as permitting new approaches in the future.

Actors in Negotiation

- Negotiation Host
  - Gatekeeper
  - Proposal Validator
  - Protocol Enforcer
  - Agreement Maker
- Negotiation Participant
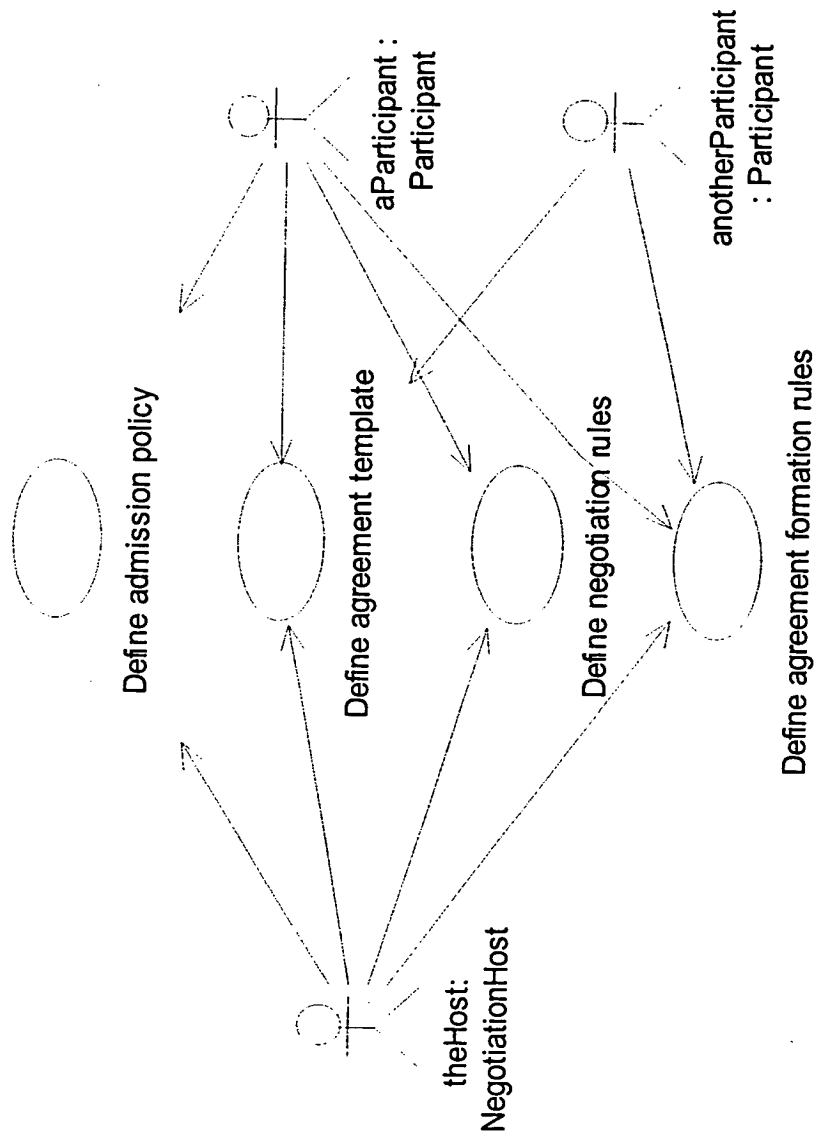- Infrastructure Provider

Actors in Negotiation
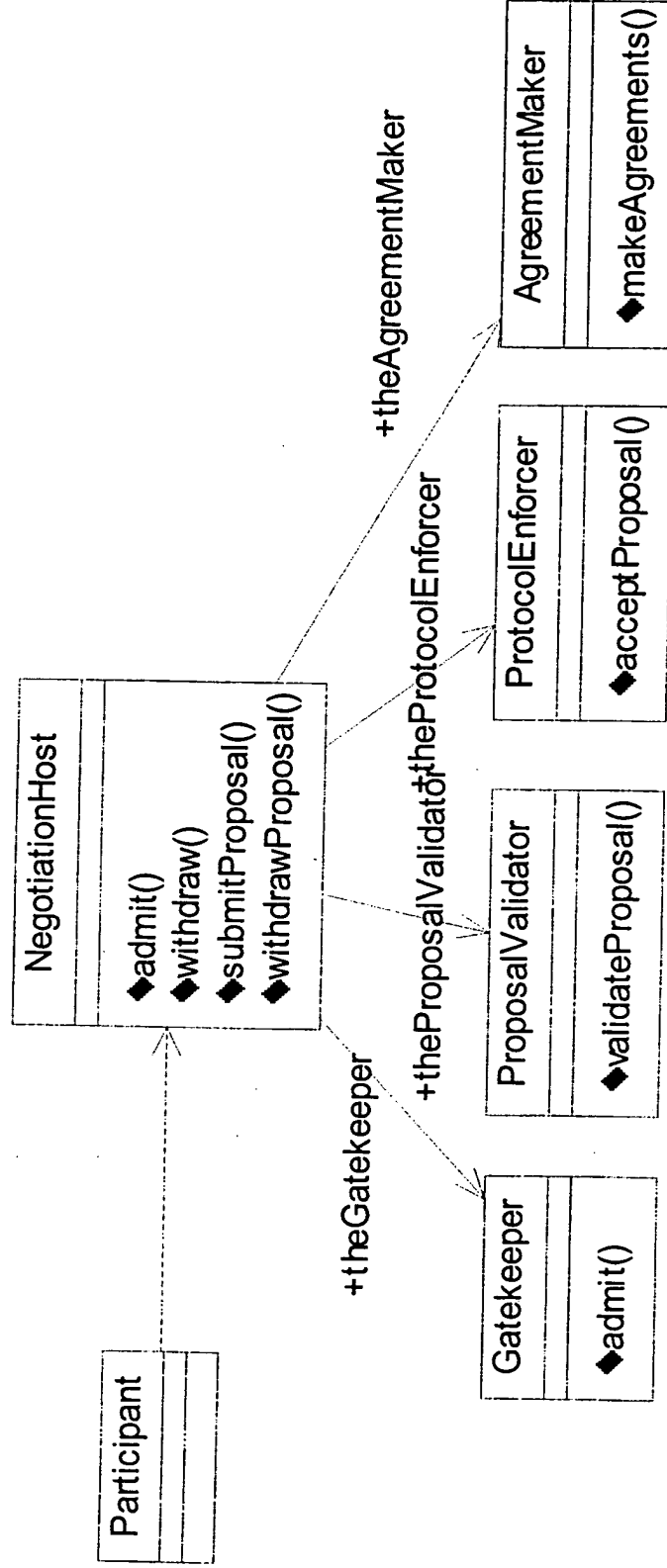
Use Cases for Negotiation

- Pre-Negotiation:
  - Define Admission Policies
  - Define Agreement Template
  - Define Negotiation Rules
  - Define Agreement Formation Rules
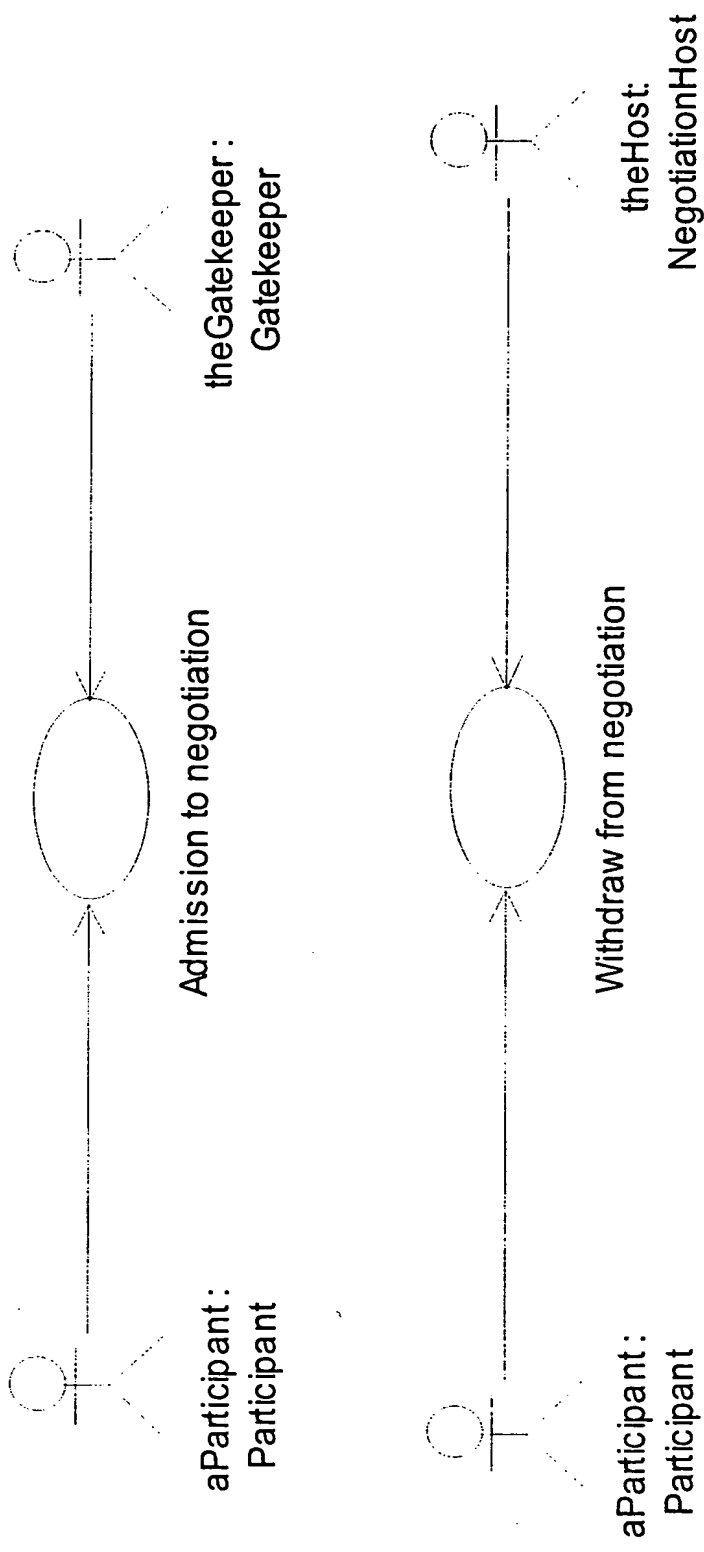
- Manage Participation
  - Admit to Negotiation
  - Withdraw from Negotiation

Use Cases for Negotiation

Define admission policy

Define agreement template

Define negotiation rules

Define agreement formation rules

aParticipant :
Participant

anotherParticipant
: Participant

theHost:
NegotiationHost

Use Cases for Negotiation

theGatekeeper :
Gatekeeper

Admission to negotiation

aParticipant :
Participant

theHost:
NegotiationHost

Withdraw from negotiation

aParticipant :
Participant

Use Cases for Negotiation

- Negotiation:
  - Initialize Negotiation Locale
  - Submit Proposal
  - Withdraw Proposal
  - Agreement Formation
  - Finalize Negotiation Locale

Use Cases for Negotiation

Relations among use-cases
are of type <<include>>,
unless otherwise specified

theProvider:
InfrastructureProvider

theHost:
NegotiationHost

Initialize negotiation infrastructure

Negotiate

Agreement formation

<<communicate>>

<<communicate>>

Submit proposal

Withdraw proposal

Finalize negotiation infrastructure

anotherParticipant
: Participant

aParticipant :
Participant
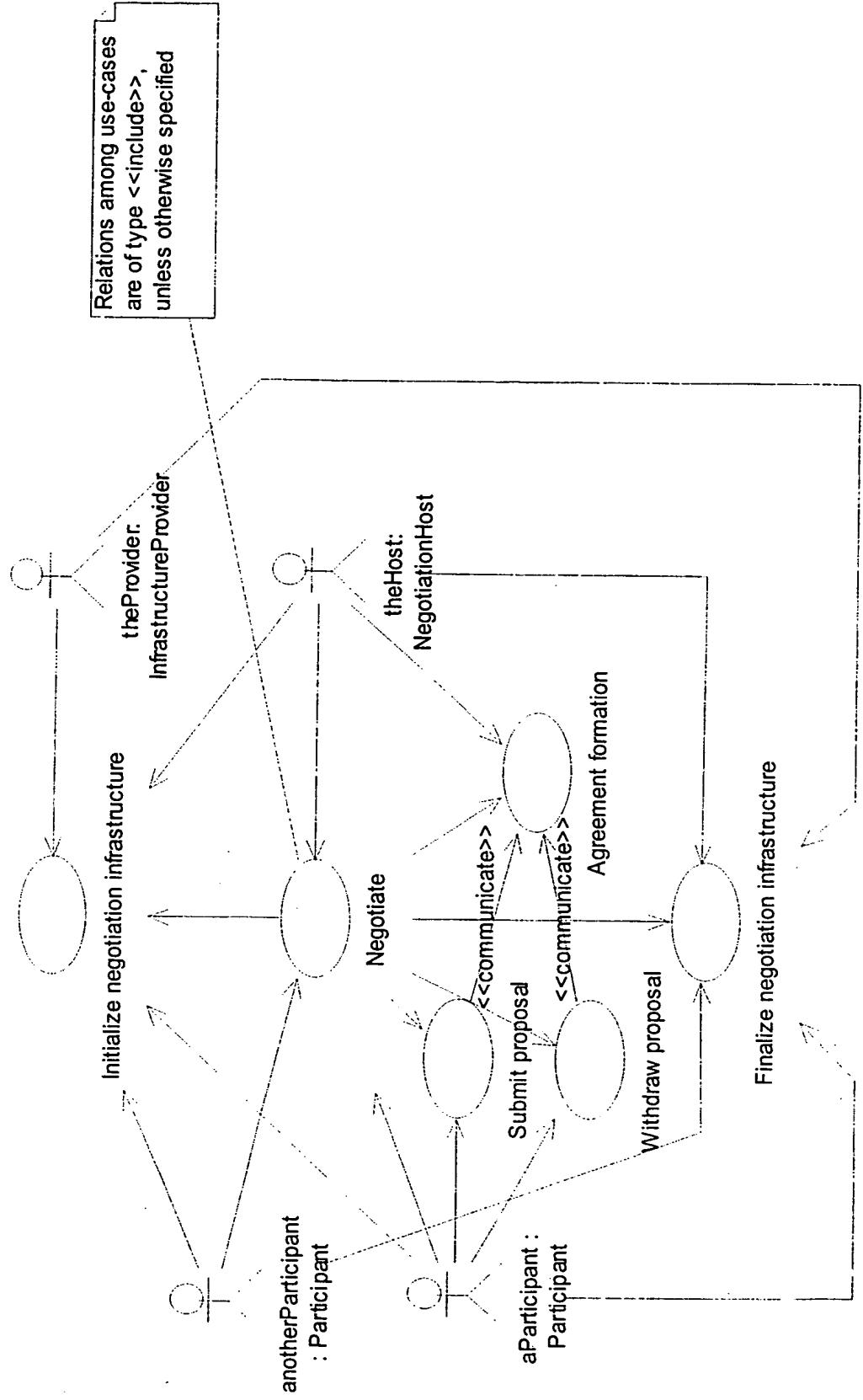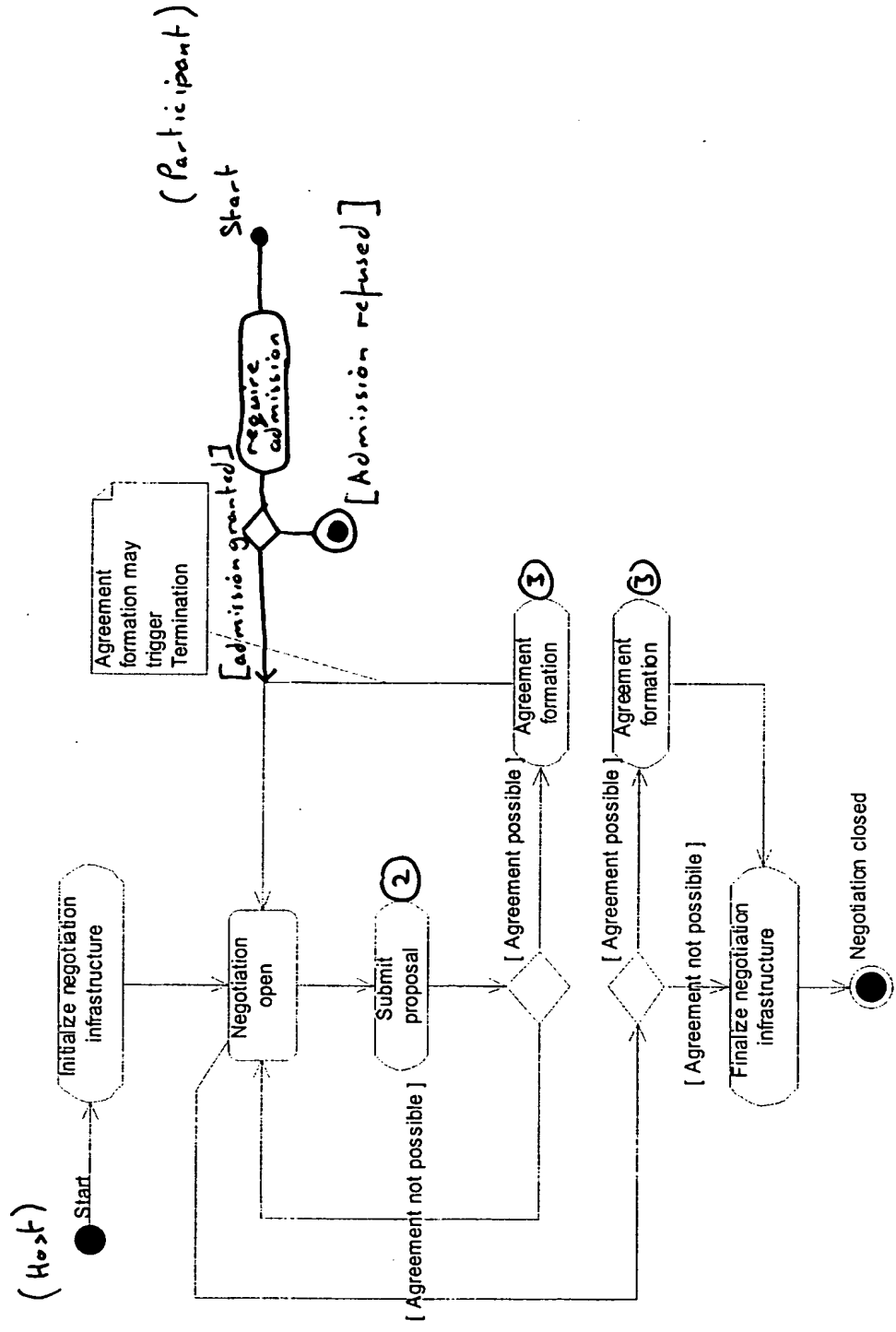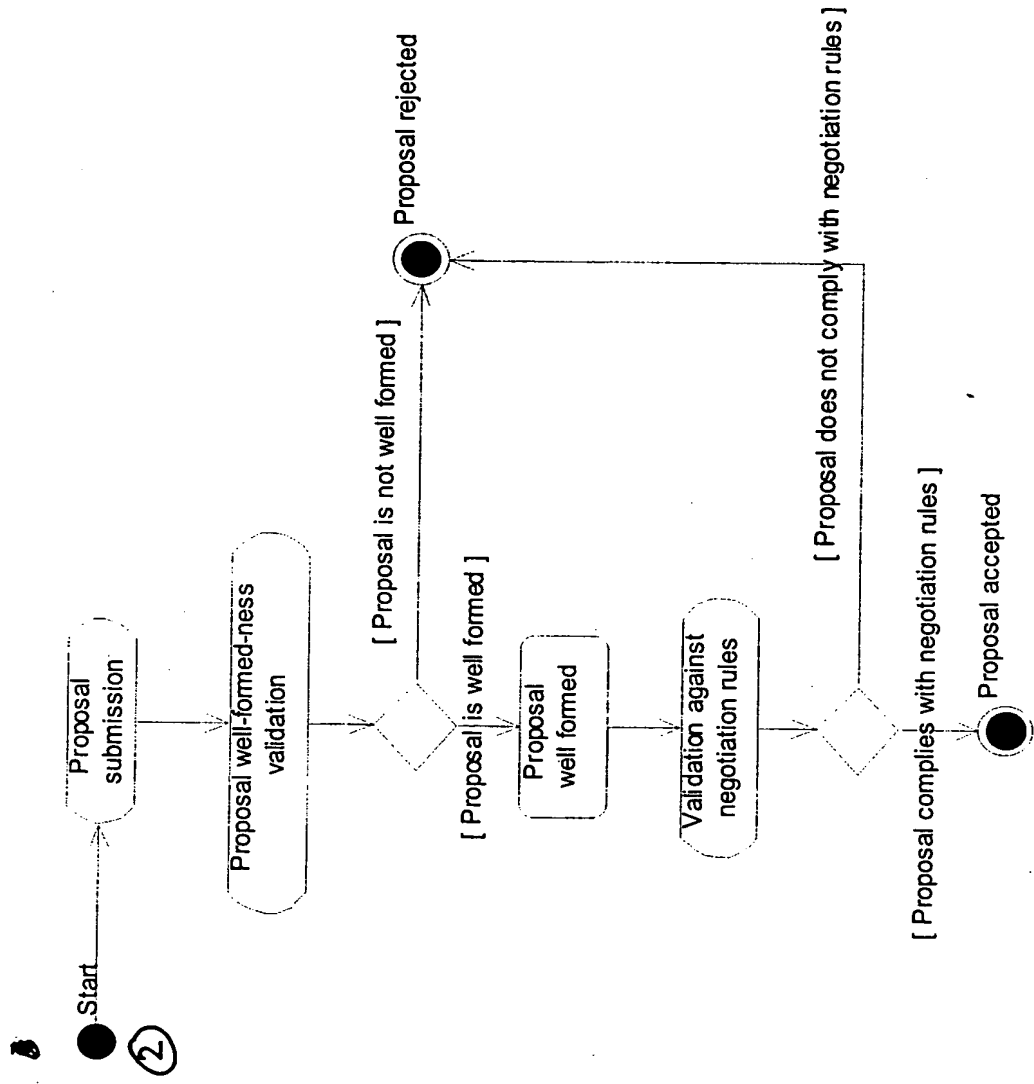
Phases of Negotiation

- Participant submits a proposal
- Host validates the proposal
  - Proposal Validator validates the proposal against the Agreement Template
  - Protocol Enforcer verifies that the proposal complies with Negotiation Rules
- If agreement is possible, Agreement Maker forms the agreement

Phases of Negotiation

(Host)

Start

Initialize negotiation infrastructure

Negotiation open

Submit proposal

(2)

[Agreement not possible]

[Agreement possible]

Agreement formation

(3)

[Agreement possible]

Agreement formation

(3)

[Agreement not possibile]

Finalize negotiation infrastructure

Negotiation closed

Agreement formation may trigger Termination

[admission granted]

require admission

[Admission refused]

(Participant)

Start

Phases of Negotiation

Phases of Negotiation

③

Start ●

Determine
agreements

[Conflicts in determining agreements]

Apply
tie-break rules

[No conflicts in determining agreements]

Create
agreements

Notify
participants

End ●
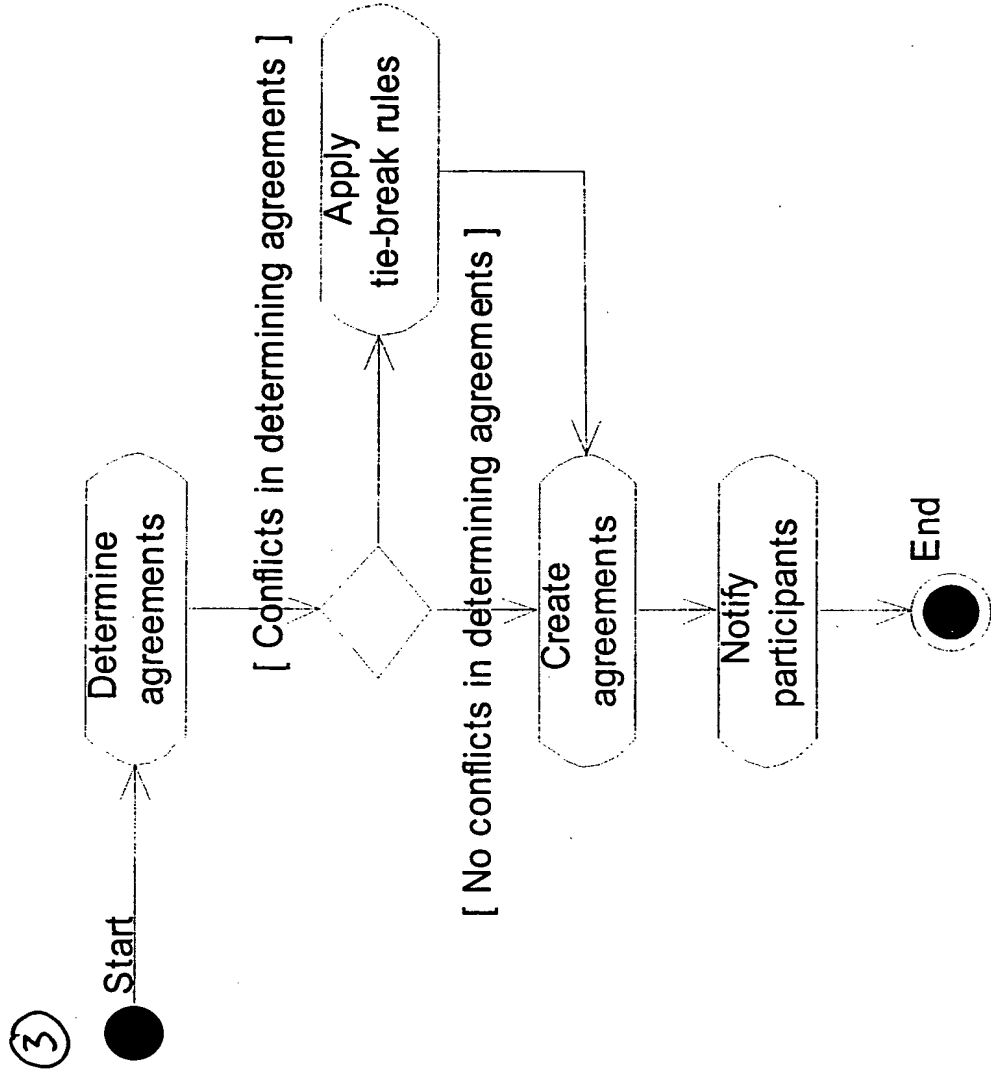
Rules for Negotiation

- Negotiation Rules
  - Posting Rule
  - Visibility Rule
  - Display Rule
  - Improvement Rule
  - Withdrawal Rule
  - Termination Rule
- Agreement Formation Rules
  - Tie-break Rules

Example: Actors

- Actors:
  - The Market Maker plays the Negotiation Host
  - Enterprise A and Enterprise B play the participants

Example: Agreement Template

Define Agreement Template

- A list of possible catalog identifiers

- A list of possible supplier names

- A list of part numbers used by the suppliers to identify the goods

- Whether the product desired by the client is new, used

- Plain text description of the product

- Desired size of the paper

- Dunn and Bradstreet code or other such codes.

Example: Negotiation Rules

- *Posting rule*
  - Anyone can submit proposals at any time
- *Visibility rule*
  - The proposal submitter can identify a sub-set of participants who are allowed to see the proposal. Notice that it's in the interest of the submitter to have their RFQ visible by as many sellers as possible, but when submitting a purchase order kind of proposal, the visibility had better be reduced, possibly to a single potential seller.

Example: Negotiation Rules

- *Information filtering (digest) rule*
  - Each of the proposals that are submitted is transmitted unchanged to the participants who are allowed to see them (see visibility rule). No data structures are defined that present a summary of the proposals.

- *Time-bounding rule*
  - Proposals are hold valid for a definite time, or up to agreement formation, whichever is first.

Example: Negotiation Rules

- *Improvement rule*
  - Improvement rules are defined to have the purchase order formation phase converge more easily (e.g. cannot go back on a proposal etc).

- *Termination rule*
  - Negotiation ends at a certain time (decided by the marketMaker)

CLAIMS

1. A computer system for allowing negotiation between a plurality of entities, the computer system comprising a computer network having a plurality of computer nodes; a computer node being arranged to define the negotiation between the entities with a set of negotiation activities; wherein the computer node is operable to implement a plurality of negotiation rule sets, each rule set constraining the set of negotiation activities to a specific negotiation type, thereby allowing an entity to select at least one of a plurality of negotiation types.

2. A computer system according to claim 1, wherein a plurality of nodes are arranged to define the negotiation between the entities with a set of negotiation activities; wherein each of the plurality of nodes are operable to implement a plurality of negotiation rule sets.

3. A computer system according to claim 1 or 2, wherein at least one of the entities is a software negotiation agent.

4. A computer system according to claim 3, wherein the computer node incorporates the software negotiation agent.

5. A computer system according to claim 1 or 2, wherein at least one of the entities is a user.

6. A computer system according to any preceding claim, wherein in at least one of the entities is a negotiation host and at least another of the entities is a negotiation participant.

7. A computer system according to any preceding claim, wherein at least one of the rule sets constrains the negotiation activities to an auction and at least another rule set constrains the negotiation activities to a one on one negotiation.

5

8. A computer system according to any preceding claim, wherein the negotiation activities include a proposal validator for validating a proposal, received from an entity, with an agreement template, a negotiation locale for providing a validated proposal to a proposal

10   compatibility checker for comparing proposals received from the negotiation locale to determine compatibility of received proposals to establish an agreement.

9. A computer system according to claim 8, wherein the negotiation

15   activities further includes a protocol enforcer for rejecting invalid proposals.

10. A computer system according to claim 9, wherein the negotiation activities further includes an information editor for providing to the

20   negotiation locale summarized proposal information.

11. A computer system according to claim 10, wherein the negotiation activities further includes an agreement maker for determining criteria for establishing an agreement based on the received proposals.

25

12. A computer system substantially as hereinbefore described with reference to the accompanying figures.

13. A computer node for coupling to a computer system to allow

30   negotiation between a plurality of entities, the computer node

comprising a processor, the processor being arranged to define the negotiation between the entities with a set of negotiation activities; wherein the processor is operable to implement a plurality of negotiation rule sets, each rule set constraining the set of negotiation

5   activities to a specific negotiation type, thereby allowing an entity to select at least one of a plurality of negotiation types.

14. A computer node according to claim 13, wherein at least one of the entities is a software negotiation agent.

10

15. A computer node according to claim 14, wherein the computer node incorporates the software negotiation agent.

16. A computer node according to claim 13 or 14, wherein at least one of

15   the entities is a user.

17. A computer node according to any of claims 13 to 16, wherein in at least one of the entities is a negotiation host and at least another of the entities is a negotiation participant.

20

18. A computer node according to any of claims 13 to 17, wherein at least one of the rule sets constrains the negotiation activities to an auction and at least another rule set constrains the negotiation activities to a one on one negotiation.

25

19. A computer node substantially as hereinbefore described with reference to the accompanying figures.

20. A method for selecting a negotiation type between a plurality of entities

30   via a computer network having a plurality of computer nodes, the

method comprising defining in a computer node a set of negotiation activities; allowing an entity to select via the computer node at least one of a plurality of negotiation rule sets, each rule set constraining the set of negotiation activities to a specific negotiation type, thereby

5   allowing an entity to select at least one of a plurality of negotiation types.

21. A method for selecting a negotiation type substantially as hereinbefore described with reference to the accompanying figures.

10

22. A computer system for allowing negotiation between a plurality of entities, the computer system comprising a computer network having a plurality of computer nodes; a computer node being arranged to define the negotiation between the entities with a set of negotiation activities;

15   wherein the negotiation activities include a proposal validator for validating a proposal, received from an entity, with an agreement template, a negotiation locale for providing a validated proposal to a proposal compatibility checker for comparing proposals received from the negotiation locale to determine compatibility of received proposals

20   to establish an agreement.

23. A computer system according to claim 22, wherein the negotiation activities further includes a protocol enforcer for rejecting invalid proposals.

25

24. A computer system according to claim 23, wherein the negotiation activities further includes an information editor for providing to the negotiation locale summarized proposal information.

25. A computer system according to claim 24, wherein the negotiation activities further includes an agreement maker for determining criteria for establishing an agreement based on the received proposals.

5   26. A computer node for coupling to a computer system to allow negotiation between a plurality of entities, the computer node comprising a processor, the processor being arranged to define the negotiation between the entities with a set of negotiation activities; wherein the negotiation activities include a proposal validator for

10   validating a proposal, received from an entity, with an agreement template, a negotiation locale for providing a validated proposal to a proposal compatibility checker for comparing proposals received from the negotiation locale to determine compatibility of received proposals to establish an agreement.

15

27. A computer node according to claim 26, wherein the negotiation activities further includes a protocol enforcer for rejecting invalid proposals.

20   28. A computer node according to claim 27, wherein the negotiation activities further includes an information editor for providing to the negotiation locale summarized proposal information.

29. A computer node according to claim 28, wherein the negotiation
25   activities further includes an agreement maker for determining criteria for establishing an agreement based on the received proposals.

ABSTRACT

METHOD AND APPARATUS FOR NEGOTIATION

5

A computer system for allowing negotiation between a plurality of entities, the computer system comprising a computer network having a plurality of computer nodes; a computer node being arranged to define the negotiation between the entities with a set of negotiation activities; wherein the computer

10   node is operable to implement a plurality of negotiation rule sets, each rule set constraining the negotiation activities to a specific negotiation type, thereby allowing a plurality of negotiation types to be selected by an entity.

15

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